

shooting upward. The maximum intensity occurred about 1.45 a. m., and the display disappeared about 2.25 a. m. Another aurora, extending from north to northeast and to altitude about 20°, was observed at Sault de Ste. Marie, Mich., about 1.15 a. m., 5th. It was of a light bluish tint, with several streamers. The display attained its maximum intensity about 2.05 a. m., and disappeared about 2.45 a. m. A third aurora, extending from north to northeast and to altitude 15°, was observed at Sault de Ste. Marie, Mich., at 12.45 a. m., 8th. It consisted of a pale diffused whitish light and continued until 3 a. m.

THUNDER-STORMS.

The more severe thunder-storms reported for the month are referred to under "Local storms."

Thunder storms were reported as follows: East of the Rocky Mountains thunder-storms were reported in the greatest number of states, 32, on the 17th; in 31 on the 3d; in 20 to 30 on the 1st, 2d, 4th, 6th, 9th to 12th, 14th to 16th, 18th to 22d, 26th, 28th, and 29th; in 10 to 19 on the 5th, 7th, 8th, 13th, 23d to 25th, 27th, and 30th. There were no dates for which

thunder-storms were reported in less than 10 states east of the Rocky Mountains.

East of the Rocky Mountains thunder-storms were reported on the greatest number of dates, 29, in Tex.; on 28 in Fla.; on 27 in Mo. and Nebr.; on 26 in La. and N. C.; on 20 to 25 in Ark., Ga., Ill., Iowa, Ky., Kans., Mich., Miss., Ohio, Pa., S. Dak., Tenn., Wis., and S. C.; on 10 to 19 in Ala., Ind., Md., Minn., N. J., N. Y., N. Dak., Va., W. Va., and Okla. T.; and on 1 to 9 in Conn., Del., D. C., Ind. T., Me., Mass., Mont., N. H., R. I., and Vt. West of the Rocky Mountains thunder-storms were reported as follows: Ariz., 25th to 27th, 29th, and 30th; Colo., 1st, 3d to 5th, 9th, 11th, 12th, 15th, 16th, 18th to 20th, and 23d to 30th; Idaho, 4th, 17th, 18th, 20th, and 26th; Nev., 24th; N. Mex., 4th, 5th, 11th to 13th, 15th, 22d, 25th to 27th, 29th, and 30th; Cal., 1st, 2d, 11th to 13th, 16th, 18th, 19th, 23d, and 24th; Oregon, 12th, 16th to 19th, 21st, 22d, and 24th; Utah, 3d, 12th to 14th, 18th, 24th, and 25th; Wash., 2d and 16th to 18th; Wyo., 1st, 3d, 9th, 12th, 14th, 18th, 20th, 25th, and 26th. There were no states and territories in which thunder-storms were not reported.

VERIFICATIONS.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the 2d and 3d days in advance. These are optional with the forecast official, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 181; temperature, 57. Percentages of verifications: weather, 86.4; temperature, 83.5; weather and temperature combined, 85.9.

Percentages of verifications of forecasts made for third day in advance. Number of predictions made, weather, 40. Percentage of verifications, 96.2.

WIND SIGNALS FOR JUNE, 1891.

Statement showing percentages of justifications of wind signals for the month of June, 1891.

Wind signals—(Ordered by Professor Cleveland Abbe.)—Total number of signals ordered, 20; justified as to velocity, 13; justified as to direction, 20. All of the signals ordered were cautionary; 17 signals were ordered for easterly winds, and 3 signals were ordered for westerly winds. Percentage of justifications, 41.5.

No cold-wave signals were ordered, and no temperature-fall warnings were issued during the month.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

FORECASTS FOR 24 HOURS IN ADVANCE.

The forecasts for districts east of the Rocky Mountains for June, 1891, were made by Professor Cleveland Abbe, Signal

Service, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, 19th Infantry.

Percentages of forecasts verified, June, 1891.

States.	Weather.	Temperature.	Weather and temperature combined.	States.	Weather.	Temperature.	Weather and temperature combined.
Maine	84.0	67.7	77.5	Arkansas	79.3	75.3	77.7
New Hampshire	81.0	68.7	76.2	Tennessee	78.0	75.3	76.9
Vermont	79.3	74.7	77.5	Kentucky	85.0	76.3	81.5
Massachusetts	86.0	75.7	81.9	Ohio	80.3	76.0	76.2
Rhode Island	86.7	72.0	80.5	West Virginia	86.7	79.7	83.9
Connecticut	89.0	77.3	84.3	Indiana	83.3	69.3	80.7
Eastern New York	84.3	79.3	82.3	Illinois	90.0	73.7	83.5
Western New York	82.3	72.0	78.2	Lower Michigan	79.3	67.3	74.5
Eastern Pennsylvania	90.7	75.3	84.5	Upper Michigan	79.3	67.3	74.5
Western Pennsylvania	78.0	75.0	76.5	Wisconsin	77.3	68.7	72.7
New Jersey	87.7	77.3	83.5	Minnesota	84.7	66.0	77.2
Delaware	87.3	78.3	83.7	Iowa	82.0	73.3	78.5
Maryland	84.7	73.7	80.3	Kansas	81.7	69.7	76.9
District of Columbia	83.3	70.0	78.0	Nebraska	81.0	72.3	77.5
Virginia	84.0	62.3	76.1	Missouri	82.0	75.0	79.2
North Carolina	86.0	61.3	74.9	Colorado	84.0	62.0	75.2
South Carolina	86.0	76.0	82.0	North Dakota	75.3	58.3	68.5
Georgia	86.7	72.3	80.9	South Dakota	81.7	72.7	78.1
Eastern Florida	89.7	83.3	87.1	Northern California	95.0	88.0	92.2
Western Florida	85.7	72.3	80.3	Southern California	99.0	93.0	96.6
Alabama	83.7	74.0	79.8	Oregon	85.7	83.0	84.6
Mississippi	82.0	68.3	76.5	Washington	80.7	83.7	81.9
Louisiana	79.0	69.0	75.0				
Texas	85.0	81.7	83.7	Monthly percentage ..	83.5	72.1	78.9

In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. The forecasts of temperature in districts east of the Rocky Mountains for June, 1891, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

STATE WEATHER SERVICES.

[Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.]

The following extracts and summaries are republished from reports for June, 1891, of the directors of the various state weather services:

ALABAMA.

Temperature.—Maximum, 104, at Wiggins, 28th; minimum, 41, at Camden, 19th; greatest monthly range, 53, at Camden; least monthly range, 17, at Chepultepec.

Precipitation.—The average was 0.42 below the normal; greatest monthly 8.65, at Valley Head; least monthly, 2.02, at Marion.

Wind.—Prevailing direction, south.—P. H. Mell, Auburn, director, State Weather Service, and observer, Signal Service.

ARKANSAS.

Temperature.—The mean was 1.2 above the normal; maximum, 103, at Lead Hill, 27th; minimum, 56, at Fayetteville, 9th, and at Rogers, 19th; greatest monthly range, 46, at Lead Hill; least monthly range, 19, at Winslow.